

## PATENT



## SPECIFICATION

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## COMPLETE SPECIFICATION

### Improvements in and relating to Self-acting Syringes for Hypodermic Injections.

I, EDMONDO LUSWERGH, of 12, Via Augusto Valenzani, Rome, in the Kingdom of Italy, Doctor in Law, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 The usual self-acting syringes for hypodermic injections provide only for the penetration of the needle, while they leave to the operator the task of effecting the immission of the liquid and withdrawing the needle after having completed the injection. Therefore two serious inconveniences may ensue, namely:—the irregularity of the injection of the liquid and the possibility of the needle  
10 breaking off while it is being withdrawn.

- The object of the present invention is to avoid the said inconveniences, by rendering automatic the three successive operations of the injection, namely:—the penetration of the needle, the immission of the liquid and the withdrawal of the needle so that it remains only to the operator, after having filled the syringe  
15 with the liquid, to apply the device against the part wherein the injection is to be effected and to determine, by pressing a catch the snap of a spring which starts the automatic succession of the said three operations, after which he may immediately draw back the apparatus.

- The accompanying drawing shows, by way of example, a construction of the  
20 self-acting syringe for hypodermic injections, according to the present invention.

Figure 1 is an elevation partly in section on the line G<sup>2</sup> H<sup>2</sup> Figure 3 of the complete apparatus before the suction of the liquid.

Figure 2 is a sectional elevation of the apparatus ready to effect the injection with the syringe filled.

- 25 Figure 3 is a view partly in section on line A<sup>2</sup> B<sup>2</sup> Figure 4 of the apparatus completely folded up for transportation, and

Figure 4 is a plan of the apparatus.

- The main body of the apparatus comprises three cylindrical and co-axial parts A, C, F, (Figure 2) sliding telescopically the one inside the other, namely  
30 the part A inside the part C, and both inside the part F. The cylinder A forms the outer casing wherein the syringe S is contained. Therein slides the piston and on its lower end is fastened the nozzle with the needle L. The cylinder A is provided with two projecting lugs B<sup>1</sup>, B<sup>2</sup>, by means of which it is secured to the mechanism which effects the injection of the liquid as will  
35 be hereinafter explained.

In the cylinder C is cut a slit D, wherein slides and is guided the lug B<sup>2</sup> on the cylinder A, which passes also through a corresponding slit D<sup>1</sup> in the

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cylinder F. On the lower end of the cylinder F slides a movable thimble Z, the position of which can be adjusted by means of a set screw P; the depth of penetration of the needle L is regulated by the position of the thimble Z with respect to the edge of the cylinder F.

Between the lower ends of the cylinders F and C is placed a helicoidal spring M, the action of which against the bottom N of the part C is prevented by means of the pawl E; and between the inner upper end of the part C and the outer lower one of the part A, is placed another helicoidal spring M<sup>1</sup>, the action of which against the annular bottom of the lower end of the part A is prevented by means of the locking lever G, Figure 3.

The lever G, Figures 1 and 3, mounted on a pivot W, is provided with a tooth which projects through an opening L<sup>1</sup> in the cylinder F and through one or other of two openings in the cylinder C into the inside of the latter and serves to fasten together the three concentric cylinders A, C, F.

The cylinder A has at its upper edge four longitudinal splits. The four segments have externally a screw h on which is screwed a ring H, which serves to press the four segments tight against the upper part K of the syringe barrel. Through the upper end of the cylinder A and the ring H passes the rod t of the piston, the said rod having at its upper end, a button a against which presses the carrying finger b of the operating mechanism. This mechanism, Figure 2, comprises a rack R, sliding inside a tubular sheath Q, which bears the finger b, and gearing with a spur wheel T. On the axle of the said wheel is secured one of the ends of a spiral spring U, the other end of which is fastened to the periphery of a drum V wherein the said spiral spring is coiled. A pawl Y acting on a ratchet wheel X secured to the wheel T prevents the unwinding of the spring when it is coiled up.

On the snapping of the pawl Y, the spiral spring U operates the rack R, which, by means of the finger b depresses the button a and drives the liquid out of the syringe through the needle L. The finger b may be given various positions by rotating the same in a plane normal to the longitudinal axis of the rack R, on the end of which it turns as on a pivot, by means of the button S<sup>1</sup>.

The apparatus works in the following manner:—

The syringe is filled by sucking the liquid to be injected and is then introduced into the tubular casing A and fastened therein by screwing the ring H whereon the depth of penetration is regulated by means of the thimble Z.

The apparatus being completely folded up, as shown in Figure 3, the tooth on the lever G projects through the opening L<sup>1</sup> in the cylinder F and the underlying opening L<sup>2</sup> (Figure 1) in the cylinder C. The cylinder F is then drawn downwards, momentary pressure being exerted upon the lower end of the lever G to release its tooth from the opening L<sup>2</sup> until said tooth snaps into another similar opening in the cylinder C, which underlies the hole L<sup>1</sup> in the position shown in Figure 1, and projects into the interior of the cylinder C above the enlarged lower end of the cylinder A. The said cylinder A is then drawn upwards and when said enlarged end contacts with the tooth on the lever G it will cause said lever to turn on its pivot W and the tooth to snap over to the lower side of the enlarged end of the cylinder A and maintain said cylinder in its drawn out position. Then the rack R is drawn out of the tube Q for a length determined by the position of the button a at the top of the piston rod, and the finger b is rotated so as to fall and rest upon said button. The rack R while drawn out winds up the spring U of the drum V.

The apparatus is then applied to the part where the injection is to be effected, and a pressure being exerted on the lever G, the spring M<sup>1</sup> is released and pushes downwards the part A, which, by means of the lugs B<sup>1</sup>, B<sup>2</sup>, carries down the driving mechanism and causes the needle L to penetrate for the quantity which is allowed to it by the thimble Z. While the part A moves downwards, the tail of the pawl Y meets the projecting edge of the cylinder C and releases the spring U, which drives, by means of the spur wheel T, the

rack R, which, in its turn, by means of the finger *b*, drives the piston downwards, presses on the liquid of the syringe and expels it out of the needle. When the liquid is completely expelled, the rack R has returned into its sheath Q, and it being somewhat longer than the said sheath projects out of the same and meets the tail *e* of the pawl E, thus releasing the spring M which drives again upwards the two cylinders C and A thereby withdrawing the needle.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A self-acting apparatus for the execution of hypodermic injections comprising in combination with an hypodermic syringe, means for driving forward the said syringe and causing the penetration of the needle to the desired depth, means for actuating the piston, after the penetration of the needle, so as to produce the injection of the liquid, and means for withdrawing the needle, when the injection has been effected.
2. An apparatus, according to Claim 1, in which the syringe is contained in a movable sheath sliding inside another cylindrical part under the action of a spring which drives it for a length corresponding to the depth to which the needle is to penetrate.
3. An apparatus, according to Claims 1 and 2, wherein the cylindrical part inside which slides the sheath with the syringe may in its turn slide in the opposite direction inside a third cylindrical casing, under the action of another spring which pushes it backwards for a distance corresponding to the depth to which the needle can penetrate.
4. An apparatus, according to the preceding claims, in which the forward stroke of the piston inside the syringe barrel after the penetration of the needle is obtained by means of a rack driven by a spring-actuated spur wheel, which moves forward together with the sheath wherein the syringe is contained.
5. An apparatus, according to the preceding claims, wherein by pressing on a detent lever the spring is released which drives forward the syringe and causes the penetration of the needle, and, during the forward motion of the syringe, the spring is released which drives the piston of the syringe, and finally at the end of the stroke of the said piston the spring is released which withdraws the syringe with the needle.
6. A self-acting apparatus for the execution of hypodermic injections constructed, arranged, and adapted to operate substantially as hereinbefore described and illustrated in the accompanying drawing.

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Fig. 1.

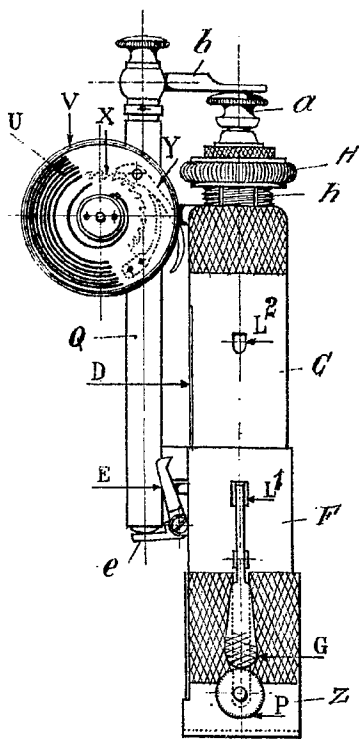


Fig. 2.

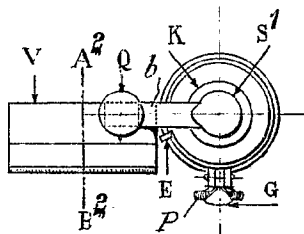
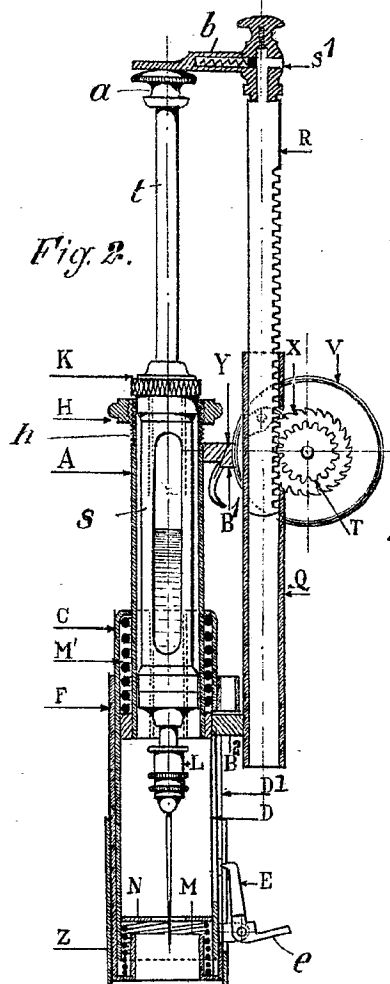


Fig. 4

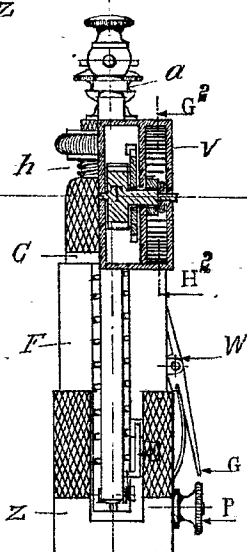


Fig. 5.